1998-99 CATS ASSESSMENT
Open-Response Item Scoring Worksheet

Grade 5—Mathematics

The **academic expectations** addressed by "Vacation Money" are

2.11 Students understand mathematical change concepts and use them appropriately and accurately.

2.13 Students understand and appropriately use statistics and probability.

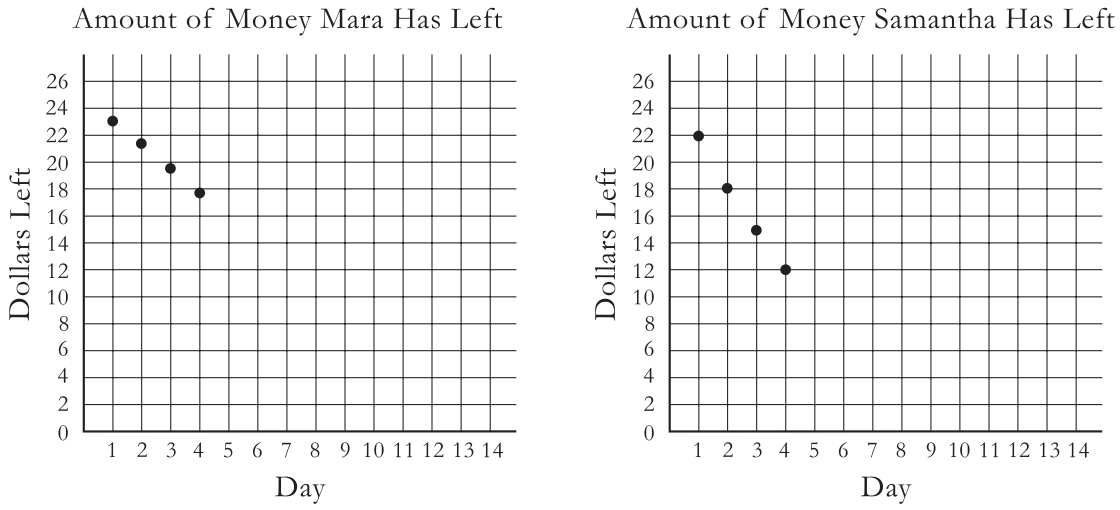
The **core content** assessed by this item includes

Probability/Statistics Concepts

- Students should understand the process of using data to answer questions (e.g., pose a question, plan, collect data, organize and display data, interpret data to answer questions).

Vacation Money

Mara and Samantha each have $25 to spend during summer vacation. At the end of each day, they mark the graphs shown below to show how much money they have left.



a. Which girl is spending money faster? Explain how you can tell from the graphs.

b. Suppose that Mara continues to spend money at the same rate. On what day will she run out of money? Explain your answer.

SCORING GUIDE
Grade 5 Mathematics

Score	Description
4	Student gives correct answer for part a with a complete explanation based on the graphs. Student gives correct answer for part b with a complete explanation based on the graph or Mara's rate of spending.
3	Student gives correct answers to both parts. Explanations are vague or incomplete but show understanding. **OR** Student gives good explanations to both parts, but one or both answer(s) are incorrect due to computation errors. **OR** Student gives correct answers to both parts with a complete explanation for either part a or b; other explanation is incorrect or missing.
2	Student gives correct answers to both parts with little or no explanation or work. **OR** Student gives correct answer for part b with or without explanation; part a is incorrect or missing. **OR** Student gives incorrect answers for both parts with some correct work.
1	Student gives correct answer for part a with or without explanation; part b is incorrect or missing. **OR** Student gives incorrect answer for part b with some correct work; part a is incorrect or missing.
0	Response is totally incorrect or irrelevant.
Blank	No response.

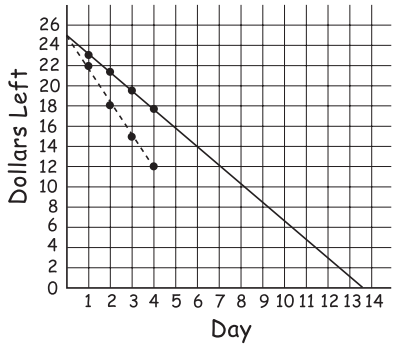
Answers: Part a: Samantha

Part b: Acceptable range: 12th — 15th day

ANNOTATED STUDENT RESPONSE
Grade 5 Mathematics

Sample 4-Point Response of Student Work

Student Response



a. I believe Samantha is spending money faster. I came to this answer by observing both girls' rate of descent and realized that Samantha's line was dropping faster. The lower the line goes, the more money is spent, therefore Samantha is spending money faster.

b. If Mara continues spending money at this rate, she will run out of money by day 14. I found this out by aligning a ruler with Mara's pattern of spending money. Second, I continued downward until the line came to the bottom of the graph. Finally, I recorded what day it was.

Student correctly answers part a.

Student gives a complete explanation of the girls' spending based on the graphs provided.

Student gives a correct answer for part b.

Student gives a complete explanation based on the graphs and rates of spending.

Overall, the student demonstrates a strong understanding of the process of using data (in the form of a graph) to answer questions by correctly answering both parts of the item and completely explaining the processes used to arrive at the correct answers.

ANNOTATED STUDENT RESPONSE
Grade 5 Mathematics

Sample 4-Point Response of Student Work

Student Response

a. Samantha is spending money faster. I can tell from the graphs because Mara's graph is decreasing by about $2 each day and Samantha's is decreasing by about $4 each day.

b. If Mara continues to spend money at the same rate she will probably run out of money sometime on the 13th day.

12 days
x 2 dollars a day
24

She will have $1 left to spend on the 13th day.

Student gives a correct answer for part a.

Student gives a correct answer for part b.

Student gives a complete explanation of the girls' spending based on the graphs provided.

Student gives a complete explanation based on the graphs and rates of spending.

Overall, the student demonstrates a strong understanding of the process of using data (in the form of a graph) to answer questions by correctly answering both parts of the item and completely explaining the processes used to arrive at the correct answers.

ANNOTATED STUDENT RESPONSE
Grade 5 Mathematics

Sample 3-Point Response of Student Work

Student Response

a. Samantha is spending money faster than Mara. I can tell by the graphs because it says on the fourth day Mara had $17.00 left and Samantha had $12.00 left on the fourth day.

b. On the 13th day Mara will be out of money. The way I figured it out was by looking at the pattern that she spent her money like on day 3 she has $19.00 left on day 4 she has $17.00 left on day 5 she had $15 left and so on. So really she spent $2.00 a day.

Student gives a somewhat vague explanation. →

Student gives an incomplete explanation (i.e., not clearly connecting the fact that Mara spent $2.00 a day to the determination that she'll run out of money on the 13th day) based on the graphs and rates of spending. →

← Student gives a correct answer for part a.

← Student gives a correct answer for part b.

Overall, the student demonstrates understanding of the process of using data (in the form of a graph) to answer questions by correctly answering both parts of the item and providing partial explanations of the processes used to arrive at the correct answers.

ANNOTATED STUDENT RESPONSE
Grade 5 Mathematics

Sample 2-Point Response of Student Work

Student Response

a. Mara is spending money faster, because day after day she spends more.

b. On the 13th day because, you keep on counting by two's and it comes down to the 13th day.

Student incorrectly answers part a.

Student gives a vague explanation based on the graphs and rates of spending.

Student correctly answers part b and gives a vague explanation.

Overall, the student demonstrates some understanding of the process of using data (in the form of a graph) to answer questions by correctly answering only one part of the item. Explanation of the processes used to arrive at the answer are vague.

ANNOTATED STUDENT RESPONSE
Grade 5 Mathematics

Sample 1-Point Response of Student Work

Student Response

a. Samantha is spending her money faster. How I can tell from the graphs are on Samantha's dots go down faster.

b. If Mara cheeps spending her money like that she will not have any more dollars. The way I get my answer was I drew dots on every dollar that she has left.

Student gives a vague explanation based on the graphs provided. →

Student gives an incorrect explanation for part b. →

← Student correctly answers part a.

← Student does not give an acceptable answer for part b.

Overall, the student demonstrates only minimal understanding of the process of using data (in the form of a graph) to answer questions by correctly answering only one part of the item. Both explanations of the processes used to arrive at the answers are incorrect or missing.

INSTRUCTIONAL STRATEGIES
Grade 5 Mathematics

The open response item **"Vacation Money"** assesses (1) students' ability to appropriately use statistics and graphs to interpret data, answer questions, and draw conclusions, and (2) students' conceptual understanding of mathematical change concepts and the ability to use them appropriately and accurately. The instructional strategies below present ideas for helping students explore and master these concepts and skills.

Using data and information in the form of differing types of graphs and tables, review the concepts, uses and skills of reading and interpreting numerical information. Discuss how data in charts, graphs, and tables can show change over time and be used in drawing conclusions and predicting outcomes. In addition, students should understand how to both create and read numerical data in graphs using scales, axis, and labels.

Since there are many different types of graphs (bar, line, circle, etc.), provide students with a variety of opportunities to read and create graphs in the context of mathematical, scientific, and social/historic situations. Use graphs to compare two or more sets of data. In addition to reading and creating graphs, students must be encouraged to draw higher level conclusions from the graphical data.

Provide opportunities for students to work individually, in pairs, in small groups, and/or as a class to complete (with teacher instruction, support and guidance) any or all of the following activities:

- Read and interpret graphs of all types on a regular basis in social studies, science, and mathematics classes.
- Have students search for different kinds of graphs in magazines and newspapers and bring them to class for sharing and further discussion.
- Prompt students with questions about the data portrayed in graphs and tables, and encourage them to ask and answer questions from each other.
- Have students graph real-life situations that change over time (e.g., daily temperature, rainfall, plant growth, the money earned in a fund raiser) and make predictions based on the graphs.
- Read, interpret, and compare the scales of different types of graphs, and practice how to interpolate scales with different divisions (determine values *between* the actual numbers shown on axis of a graph).
- Review raw data (e.g., in "Vacation Money," on day four, Samantha has $12 left) and draw higher-level, less obvious conclusions (e.g., in "Vacation Money," Mara will probably run out of money on day 14).
- Examine and solve problems that show two or more of the same kind of graph or table with comparable but different data and draw conclusions and determine differences between sets of data using computation.